

DOCKET NO.: 257502US0PCT



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF :

SHAHRAM MIHAN, ET AL. : EXAMINER: BULLOCK, IN SUK

SERIAL NO: 10/506,602 :

FILED: SEPTEMBER 10, 2004 : GROUP ART UNIT: 1764

FOR: OLIGOMERIZATION OF OLEFINS :
COMPRISING AT LEAST THREE
CARBON ATOMS

APPEAL BRIEF

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

Further to the Notice of Appeal filed herewith, this is an Appeal from the August 13, 2007 Office Action.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is BASF AKTIENGESELLSCHAFT, Ludwigshafen, Germany.

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II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals, interferences, or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

Claims 1-3 and 5-20 are pending and stand rejected.

Claim 4 has been cancelled.

The rejections of claims 1-3 and 5-20 are being appealed. The claims have been twice rejected. *See* February 23, 2006, November 14, 2006, and August 13, 2007 Office Actions.

IV. STATUS OF AMENDMENTS

The outstanding Office Action is a non-final Office Action and, thus, no Amendment After Final Rejection has been filed.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 is directed to a process for the oligomerization of α -olefins having at least three carbon atoms. *See* present specification, page 1, lines 4 to 5; claim 1. The process involves bringing such an olefin into contact with a particular catalyst system. *See* present specification, page 1, line 35 to page 2, line 17; claim 1. The particular catalyst

system includes: a) at least one chromium source; b) at least one ligand comprising 1,3,5-tri-n-dodecyl-1,3,5-triazacyclohexane; and c) at least one activator comprising a boron compound. *See* instant specification, page 1, line 40 to page 2, line 39; claim 1. A molar ratio of B:Cr in the particular catalyst system is at least 5. *See* present specification, page 3, lines 35 to 38; claim 1. Claims 2, 3 and 5-20 depend directly or indirectly from claim 1. *See* claims 2, 3 and 5-20.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1-3 and 20 are rejected under 35 U.S.C. §102(b), or in the alternative under 35 U.S.C. §103(a), over WO 00/58319 to Maas et al. ("Maas")*.

VII. ARGUMENT

Appellants submit that the outstanding rejection should be reversed for the following reasons.

As indicated above, claims 1-3 and 5-20 are rejected under 35 U.S.C. 102(b), or in the alternative under 35 U.S.C. §103(a), over Maas.

Claim 1 recites "[a] process for the oligomerization of α -olefins having at least three carbon atoms, in which the olefin is brought into contact with a catalyst system obtainable from a) at least one chromium source; b) at least one ligand comprising 1,3,5-tri-n-dodecyl-1,3,5-triazacyclohexane; and c) at least one activator comprising a boron compound, with the

* Comments regarding Maas are made with reference to U.S. Patent No. 6,844,290, a U.S. counterpart to Maas.

molar ratio of B:Cr being at least 5" (emphasis added). Maas does not disclose or suggest such a process.

The Examiner asserts that Maas discloses a process for oligomerizing olefins including contacting the olefins with a catalyst system including a chromium compound CrX_3 , a ligand such as 1,3,5-tri-n-dodecyl-1,3,5-triazacyclohexane, and a boron compound such as trispentafluorophenylborane. *See* August 13, 2007 Office Action ("Office Action"), pages 3 to 4. Maas does, in fact, disclose that catalysts can separately include chromium compounds CrX_3 (*see* column 4, line 51 to column 5, line 4), 1,3,5-tri-n-dodecyl-1,3,5-triazacyclohexane (*see* column 3, lines 22 to 23), and a boron compound (*see* column 7, line 54 to column 8, line 4). It is undisputed, however, that Maas does not disclose a catalyst including these three particular components, in combination, as recited in claim 1.

The Examiner fails to demonstrate a reason why one of ordinary skill in the art would have been motivated to select the particular combination of components recited in claim 1. In the April 16, 2007 Advisory Action, the Examiner baldly asserted that "one of ordinary skill in the art could determine the most effective ligand among those disclosed by Maas to achieve desired results." *See* April 16, 2007 Advisory Action, page 2. However, it should be noted that Maas discloses that its catalyst may include any of a myriad of different 1,3,5-triazacyclohexane compounds. *See, e.g.* Maas, column 1, lines 12 to 29 (note formula I). In addition, the "preferred" 1,3,5-triazacyclohexane compounds of Maas are numerous. *See, e.g.* Maas, column 3, lines 1 to 26. Applicants submit that more than mere hope to "achieve desired results" would be required to prepare a catalyst including the particular combination of features recited in claim 1 based on the disclosure of Maas. As is settled, the Examiner must identify a "reason that would have prompted a person of ordinary skill in the relevant

field to combine the elements in the way the claimed new invention does." *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741 (U.S. 2007).

For at least the foregoing reasons, Applicants submit that the Examiner has failed to make a *prima facie* case of obviousness. However, even if the Examiner succeeded in making such a *prima facie* case, Applicants submit that such case is rebutted by the results shown in the present specification – "[a] *prima facie* case of obviousness ... is rebuttable by proof that the claimed compounds possess unexpectedly advantageous or superior properties." See MPEP §2144.09 (citing *In re Paesch*, 315 F.2d 381 (C.C.P.A. 1963)). The Examples of the present specification demonstrate that catalysts according to the present invention (Examples 1 and 2) provide superior results relative to, for example, the catalysts of Maas (Comparative Example 4 actually corresponds to Example 21 of Maas). See present specification, page 5, line 40 to page 6, line 27. In particular, the Examples demonstrate that the presence or absence of the particular 1,3,5-triazacyclohexane compound of claim 1 (1,3,5-tri-n-dodecyl-1,3,5-triazacyclohexane) (*compare* Examples 1 and 2 and Comparative Example 4) or the presence or absence of boron and chromium in the particular molar ratio recited in claim 1 (at least 5) (*compare* Examples 1 and 2 and Comparative Example 3) dramatically affect the activity of the resulting catalyst. See present specification, page 6, Table. For convenience, the results are reproduced below:

TABLE

| Ex. | Cat [μ mol] | DMAB* | TIBAL** | DEAC** | Activity $\text{kgC}_{12}/\text{mol}_{\text{Cr}}/\text{h}$ |
|------|------------------|-------|---------|--------|---|
| 1 | 39.4 | 10 | 50 | 5 | 283 |
| 2 | 38.5 | 10 | 50 | — | 175 |
| 3*** | 40.6 | 2 | 50 | — | 130 |
| 4*** | 38.1 | 10 | 50 | — | 67 |

*Molar ratio of B:Cr

**Molar ratio of Al:Cr

***Comparative examples

These results are objective evidence of the improvements of the catalyst of claim 1 over known catalysts as in Maas, and thus these results rebut any suggestion that it would have been obvious to modify the catalysts of Maas as proposed in the Office Action.

The Examiner has reviewed the results set forth in the present specification, and has indicated that "[t]he demonstrated superior result of the claimed invention is not persuasive because the reference has disclosed the components of the catalyst system." *See* November 14, 2006 Office Action, page 6. The Examiner has given no weight to the rebuttal evidence set forth in the present specification. Applicants submit that the evidence in the present specification provides a side-by-side comparison between compositions according to claim 1 and the closest example in the only cited reference. The Examples according to the present invention and the Comparative Example according to Maas differ only in the particular 1,3,5-triazacyclohexane compound employed. *See* present specification, page 5, lines 42 to 45. This is the very parameter that the Examiner has asserted that it would be obvious to select. Applicants submit that there is a clear nexus between the rebuttal evidence and the claimed invention, and that the rebuttal evidence is entitled to great weight. Given the proper weight, Applicants submit that the evidence in the present specification plainly rebuts any alleged *prima facie* case of obviousness.

As explained, claim 1 is not anticipated by and would not have been rendered obvious by Maas. Claims 2, 3 and 5-20 depend from claim 1 and, thus, also are not anticipated by and would not have been rendered obvious by Maas. Accordingly, reversal of the rejection is respectfully requested.

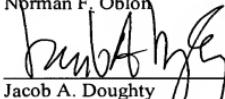
VIII. CONCLUSION

For the above reasons, it is respectfully requested that all outstanding rejections of the pending claims be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.

Norman F. Oblon


Jacob A. Doughty
Registration No. 46,671

CLAIMS APPENDIX

Claim 1 (Previously Presented): A process for the oligomerization of α -olefins having at least three carbon atoms, in which the olefin is brought into contact with a catalyst system obtainable from

- a) at least one chromium source;
 - b) at least one ligand comprising 1,3,5-tri-n-dodecyl-1,3,5-triazacyclohexane;
- and
- c) at least one activator comprising a boron compound, with the molar ratio of B:Cr being at least 5.

Claim 2 (Previously Presented): The process as claimed in claim 1, wherein the activator further comprises an alkylaluminum compound.

Claim 3 (Previously Presented): The process as claimed in claim 2, wherein the activator comprises a trialkylaluminum and an alkylaluminum halide.

Claim 4 (Cancelled)

Claim 5 (Previously Presented): The process as claimed in claim 1, wherein the boron compound has the formula BZ_3 and/or $Cat^{\oplus} BZ_4^{\ominus}$, where Z is an electron-withdrawing radical and Cat $^{\oplus}$ is a cation.

Claim 6 (Previously Presented): The process as claimed in claim 5, wherein the boron compound is selected from the group consisting of trispentafluorophenylborane, N,N-dimethylanilinium tetrakis(pentafluorophenyl)borate, tri-n-butylammonium

tetrakis(pentafluorophenyl)borate, N,N-dimethylanilinium tetrakis(3,5-bis(2,2,2-trifluoroethyl)phenyl)borate, tri-n-butylammonium tetrakis(3,5-bis(2,2,2-trifluoroethyl)phenyl)borate, tritylium tetrakis(pentafluorophenyl)borate, and mixtures thereof.

Claim 7 (Previously Presented): The process as claimed in claim 1, wherein the olefin is 1-butene.

Claim 8 (Previously Presented): The process as claimed in claim 1, wherein the chromium source is selected from the group consisting of chromium(II) compounds, chromium(III) compounds, and mixtures thereof.

Claim 9 (Previously Presented): The process as claimed in claim 1, wherein the chromium source is CrCl₃.

Claim 10 (Previously Presented): The process as claimed in claim 2, wherein the alkylaluminum compound is selected from the group consisting of trimethylaluminum, triethylaluminum, tri-n-propylaluminum, triisopropylaluminum, tri-n-butylaluminum, triisobutylaluminum, diethylaluminum chloride, diethylaluminum bromide, diethylaluminum ethoxide, diethylaluminum phenoxide, and ethylaluminum ethoxide fluoride.

Claim 11 (Previously Presented): The process as claimed in claim 3, wherein the trialkylaluminum is selected from the group consisting of trimethylaluminum, triethylaluminum, tri-n-propylaluminum, triisopropylaluminum, tri-n-butylaluminum, and triisobutylaluminum.

Claim 12 (Previously Presented): The process as claimed in claim 3, wherein the alkylaluminum halide is selected from the group consisting of diethylaluminum chloride, ethylaluminum dichloride, and diethylaluminum bromide.

Claim 13 (Previously Presented): The process as claimed in claim 3, wherein a molar ratio of the trialkylaluminum to the alkylaluminum halide is 1-50:1.

Claim 14 (Previously Presented): The process as claimed in claim 3, wherein a molar ratio of the trialkylaluminum to the alkylaluminum halide is 3-20:1.

Claim 15 (Previously Presented): The process as claimed in claim 2, wherein a molar ratio of the chromium source to the alkylaluminum compound ranges from 1:1 to 1:200.

Claim 16 (Previously Presented): The process as claimed in claim 2, wherein a molar ratio of the chromium source to the alkylaluminum compound ranges from 1:5 to 1:100.

Claim 17 (Previously Presented): The process as claimed in claim 1, wherein the oligomerization is performed at a temperature ranging from 0 to 120°C, and at a pressure ranging from ambient pressure to 120 bar.

Claim 18 (Previously Presented): The process as claimed in claim 17, wherein the temperature ranges from 25 to 110°C.

Claim 19 (Previously Presented): The process as claimed in claim 1, wherein the oligomerization is performed under a protective gas.

Claim 20 (Previously Presented): The process as claimed in claim 19, wherein the protective gas is selected from the group consisting of nitrogen and argon.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.